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| 09/943,389      | 08/30/2001  | Sadaaki Sakamoto     | P/1071-1439         | 8221             |

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06/12/2003

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EXAMINER

MAYES, MELVIN C

ART UNIT

PAPER NUMBER

1734

DATE MAILED: 06/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/943,389

Applicant(s)

SAKAMOTO ET AL.

Examiner

Melvin Curtis Mayes

Art Unit

1734

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-18 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

(1)

Claim 6 objected to because of the following informalities: it should read "alumina powder **having** a particle size of.... Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

(2)

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

(3)

Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 depends from itself. For examination purposes, Claim 10 is assumed to depend from Claim 9 since the subject matter of Claim 10 is also claimed in Claim 16 which depends from Claim 1.

***Claim Rejections - 35 USC § 103***

(4)

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

(5)

Claims 1-5, 7, 8, 11 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hakotani et al. 5,370,759 in view of Fukuta et al. 5,456,778.

Hakotani et al. disclose a method for producing a multilayered ceramic substrate for mounting and interconnecting electronic components exterior thereof comprising: forming green sheets of borosilicate glass or lead borosilicate glass and alumina; forming conductor pattern on the green sheets; stacking the green sheets; sandwiching the stacked green sheets between two inorganic material green sheets of magnesium oxide which do not sinter at the sintering temperature of the borosilicate glass of the green sheets; and sintering by heating the laminate to 900°C over one hour including a retention time of about 12 minutes at 900°C; and removing the unsintered magnesium oxide layers from the surface of the laminate (col. 1, lines 7-10, col. 5, lines 30-38, col. 10, line 50 – col. 11, line 56).

Fukuta et al. 5,456,778 teach that glass for preparing low-temperature-sinterable green sheets for making a ceramic circuit substrate by laminating with unsinterable green sheets can be a mixture of glass of the  $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$  system and alumina, a mixture of glass of the  $\text{PbO-SiO}_2\text{-B}_2\text{O}_3$  system and alumina or glass of the  $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$  system (col. 5, lines 6-10).

It would have been obvious to one of ordinary skill in the art to have modified the method of Hakotani et al. for producing a multilayered ceramic substrate by providing the borosilicate glass of the green sheets as a glass of the  $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$  system, as taught by Fukuta et al., as a glass used to prepare low-temperature-sinterable green sheets for making a ceramic circuit substrate by laminating with unsinterable green sheets. By providing the green sheets of borosilicate glass of the  $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$  system, as taught by Fukuta et al., and the unsinterable inorganic material green sheets of magnesium oxide, borosilicate glass and magnesium oxide (magnesia) chemically react during sintering to form a reaction layer along the

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interface between the green sheet and the inorganic material green sheet, as claimed in Claim 1, form a crystal phase, as claimed in Claim 2, and one of the glass or magnesia is diffused, dissolves or forms a solid solution in the other, as claimed in Claim 5.

Mounting at least one electronic component on an outer surface of the multilayered ceramic substrate after firing, as claimed in Claim 14, would have been obvious to one of ordinary skill in the art, as Hakotani et al. disclose that the produced multilayered ceramic substrate is for mounting and interconnecting electronic components exterior thereof.

By heating the laminate to 900°C over one hour, the temperature is raised at about 15°C or less during firing, as claimed in Claim 7.

(6)

Claims 7-10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claim 1 or 11 above, and further in view of Mikeska et al. 5,254,191.

Mikeska et al. teaches that a typical batch furnace cycle which can be used to heat an assemblage of green sheets and unsinterable constraining layers comprises heating at 5°C/min to the peak temperature and maintaining the peak temperature for 30 minutes (col. 12, lines 36-47).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined for making a multilayered ceramic substrate using inorganic material constraining green sheets by sintering at a rate of 5°C/min, and thus less than 15°C/min as claimed in Claim 7, and maintaining the peak temperature for 30 minutes, as taught by Mikeska et al., as a typical batch furnace cycle that can be used to heat an assemblage of green sheets and unsinterable constraining layers. Sintering using the typical batch furnace cycle, as taught by Mikeska et al., would have been obvious to one of ordinary skill in the art.

(7)

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claim 17 above, and further in view of Stoller 6,392,896.

Stoller teaches that in making semiconductor packaging, a ceramic substrate is joined to a next level of packaging, typically a motherboard, by solder elements (col. 4, lines 6-12).

It would have been obvious to one of ordinary skill in the art to have modified the multilayered ceramic substrate produced by the method of the references as combined by connecting the ceramic substrate to a motherboard, as taught by Stoller, for making semiconductor packaging.

***Allowable Subject Matter***

(8)

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

(9)

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kumar et al. teach forming a reactive layer by interaction of the ceramic of the inert top layer with the green tape ceramics.

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Various references disclose making ceramic substrates using constraining layers or inorganic composition layers of alumina, magnesia, calcia, silica, baria, zirconia, cesia, aluminum nitride, boron nitride, mullite or silicon carbide.

Fukuta et al. 5470412 and Sakamoto et al. 6395118 teach using alumina of average particle size of 500 nm.

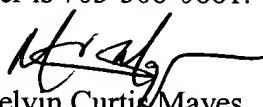
Burgess et al. teach that a multilayered ceramic substrate having input/output pins is connected to a motherboard (col. 3, lines 28-39).

(10)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 703-308-1977. The examiner can normally be reached on Mon., Wed. and Fri. 7:00 AM - 3:30 PM and Tues, Thurs. 8:30 AM – 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 703-308-3853. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

  
Melvin Curtis Mayes  
Primary Examiner  
Art Unit 1734

MCM  
June 11, 2003